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Beech Root Sprouts Can Be Damaged By Sodium Arsenite Treatment Of Parent Tree

American beech (Fagus grandifolia) can produce an abundance of root sprouts. In some cut-over woodlands, the sprouts occupy space that could be utilized by more desirable tree species. Therefore it seemed desirable to explore methods of destroying beech root sprouts.

We already had some evidence that this could be done by putting sodium arsenite solution into parent trees: in 1950, a few dead beech sprouts were found near large beech trees that had been treated with sodium arsenite solution during earlier experiments. The treatment was repeated to check these earlier observations. A few sprouts at least 4 feet tall were killed near treated beech trees. In addition, three stumps of beech that had been cut 28 days previously were also treated. Near them, a few sprouts and three beech trees 8 to 10 inches d.b.h. were killed; these larger stumps were at least 10 feet from the stumps.

These observations led to a larger exploratory study in 1951. Two $\frac{1}{4}$-acre plots were selected in a stand of mature beech located on the Paul Smith Experimental Forest. All beech trees 4 inches or more in d.b.h. were treated. Trees on both plots ranged from 4 to 20 inches d.b.h. (average, 11 inches); there were 25 of them on plot A and 20 on plot B. Tree size and other conditions were similar on both plots, which were located only about 300 feet apart.

Chemical Treatment

The chemical was applied in two dosages, spaced 14 days apart so that some of it would be applied after the tree crowns had been killed. The first treatment was applied on July 18. It was the same on both plots. Holes were bored 4 inches apart in a ring around each tree, and about 3 feet above the ground. Each hole was 4 inches deep and 7/16 inch in diameter, and held about 9 cc. of sodium

arsenite solution. The solution was made with equal weights of commercial-grade sodium arsenite powder and water.

Two weeks later crown mortality of treated trees averaged 90 percent for both plots. Damage had also been done to 10 percent of the beech root sprouts on plot A, and to 21 percent of those on plot B. Damage to the sprout foliage varied from a few dead leaves to complete mortality. It was assumed that some of the chemical had been translocated to the tree crowns and some to the sprouts, since damage to both occurred simultaneously.

The second phase of the treatment came 2 weeks after the first one. This time the treatments were varied. On plot A, the original holes were refilled with the sodium arsenite solution. But on plot B, a second series of fresh holes were bored and filled with the solution; the new holes were also 4 inches apart, but these holes were placed 6 inches below the original ones, between them, and in wood apparently undamaged by the first application of chemical.

Within 3 weeks after this second application of chemical, crown mortality on the treated trees had increased by 4 and 7 percent on plots A and B respectively. Damage to root sprouts had increased by 9 percent on plot A and 20 percent on plot B--nearly the same amount of damage as within 2 weeks after the first application of chemical. Thus within 5 weeks after the first treatment, damage had been done to 19 percent of the sprouts on plot A and to 41 percent of those on plot B.

Later Effects Of Treatments

By September 19 (9 weeks after the first treatment) crown mortality on the treated trees totaled 96 and 98 percent on plots A and B respectively. Damage also had occurred to 24 percent of the sprouts on plot A and 44 percent of those on plot B. By the following spring the crowns of all treated beech trees were dead; there was no evidence of recovery within the next 3 years.

To determine the number of root sprouts affected, all untreated beech at least 1 foot high were examined on June 6, 1952, nearly 11 months after the study began. It was easy to distinguish beech root sprouts from beech seedlings: the seedlings had normal root systems; the sprouts did not. The sprout stems grew at right-angles from roots that generally were at least $\frac{1}{2}$ inch in diameter. Sprouts several feet high had only a few small roots of their own. Most sprouts were 2 to 4 feet high, but several were about 4 inches d.b.h.

Table 1 shows the amount of crown damage to the sprouts. Although 99 percent of the sprouts on plot A were perceptibly affected, as compared to 74 percent on plot B, the difference lies mostly in the lightly damaged categories

Table 1.--Beech root sprouts damaged by sodium arsenite placed in parent trees 11 months earlier

Plot	Crown-damage class (in percent)					Total damaged	Not damaged	Total sprouts
	Trace	1-24	25-49	50-89	90-100			
	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Number
A	17	31	19	21	11	99	1	174
B	3	15	14	16	26	74	26	230

and does not appear to be of much significance. When the comparison is limited to sprouts showing 25 percent or more crown damage, results on the two plots are similar--51 vs. 56 percent of the sprouts affected.

Dead foliage on the trees and sprouts indicated that the associated branches were completely dead. Most dead leaves still remained on the beech trees 9 weeks after they had died--a typical reaction to sodium arsenite.

Sprouting at stump level was negligible on the treated trees. Within 3 years after treatment, only one new stump sprout developed within each plot. Each of these was 6 inches high.

Sodium arsenite in the beech roots has had no noticeable effect on the development of beech seedlings present when the treatments were made. There were about as many root sprouts as seedlings among the untreated beech over 1 foot high. No damaged seedlings were found. Two years after the treatments, plot A contained 6,320 beech seedlings and plot B contained 3,390. The seedlings appeared to be thrifty.

The results of this study show that sodium arsenite solution applied to beech trees in bored holes can move downward and out through the roots to sprouts that originate

from those roots. Though the killing of root sprouts in these tests did not approach 100 percent, the killing and injury brought about do indicate that methods probably could be perfected for killing both the tree and its root sprouts by treating only the tree.

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